QUALITY ASSURANCE PROJECT PLAN FOR BROWNFIELD ASSESSMENTS

Prepared by the
Missouri Department of Natural Resources
Division of Environmental Quality
Hazardous Waste Program
Brownfields/Voluntary Cleanup Section

Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102-0176

A. PROJECT MANAGEMENT ELEMENTS

A.1 TITLE AND APPROVAL SHEET

Brownfield Assessment Quality Assurance Project Plan
Missouri Department of Natural Resources
Division of Environmental Quality

DEPARTMENT APPROVALS

John Madras — 9/16/05
Division Quality Assurance Manager — Date

Robert Bell — 9/15/05
Director, Hazardous Waste Program (HWP) — Date

Corey Bridges — 9/07/05
B/VCP Quality Assurance Project Officer, HWP — Date

STATEWIDE CONTRACTOR APPROVALS

Director, Statewide Contractor — Date

Project Manager, Statewide Contractor — Date

Project Field Superintendent, Statewide Contractor — Date

QA/QC Manager, Contractor — Date

A.2 TABLE OF CONTENTS

A.3 DISTRIBUTION LIST

Missouri Department of Natural Resources (MDNR)
John Madras – Quality Assurance Manager, Environmental Policy Director, Division of Environmental Quality (DEQ)

Hazardous Waste Program (HWP)
Bob Geller – Director
Jim Belcher – Environmental Manager, Brownfields/Voluntary Cleanup Section (B/VCP)
Christine O'Keefe – Project Officer, B/VCP
Carey Bridges – Quality Assurance Project Officer, B/VCP
Project Managers – B/VCP

Statewide Contractor (contractor)
Director
Project Manager
Project Field Superintendent
Contractor/Consultant/Laboratory – Quality Assurance Project Plan Coordinator

A.4 PROJECT/TASK ORGANIZATION

The following list identifies key individuals and organizations participating in this project, and discusses their specific roles and responsibilities as they pertain to this Quality Assurance Project Plan (QAPP).

Christine O'Keefe – Project Officer Brownfields/Voluntary Cleanup Section, HWP
Responsibilities: Overall management and coordination of site-specific activities as they relate to this QAPP, including correspondence, communication and scheduling. Review plans, reports, and data to ensure that site-specific activities conducted pursuant to this QAPP meet project specific Data Quality Objectives (DQO).

Project Manager - Brownfields/Voluntary Cleanup Section, HWP
Responsibilities: Management and coordination of site-specific activities as they relate to this QAPP, including correspondence, communication and scheduling. Review plans, reports, and data to ensure that site-specific activities conducted pursuant to this QAPP meet project specific Data Quality Objectives (DQO).

John Madras – Environmental Policy Director, DEQ,
Responsibilities: Monitors the overall Quality Assurance (QA) operations for the division. Develops and maintains the Quality Management Plan (QMP). Reviews and approves all QAPPs for the division.

Project Manager – Contractor
Responsibilities: Supervise and schedule field staff conducting sample collection and site assessment activities. Assures that staff are qualified and trained to perform the work, familiar with the required Standard Operating Procedures

(SOP), including those related to Quality Assurance/Quality Control (QA/QC), and have the equipment necessary to perform the work. Reviews reports generated by staff for completeness, clarity and accuracy. Prepare formal reports for Brownfields/Voluntary Cleanup Program (B/VCP) staff review and approval.

Project Field Superintendent - Contractor
Responsibilities: Prepare and/or implement site-specific sampling plans to collect environmental samples according to contractor SOPs at potential and/or confirmed hazardous substance sites. Conduct sample collection by appropriate methods to provide data of sufficient quality. Prepare and implement health and safety plans for investigations conducted by the contractor at potential and/or confirmed hazardous substance sites. May prepare formal reports of sampling investigations for B/VCP staff to evaluate and include in Brownfield Assessment reports.

QA/QC Manager - Contractor
Responsibilities: Reviews site-specific QAPPs and other documents as needed to ensure quality data. Performs field audits of contractor staff who conduct sampling activities in order to verify that staff are following the contractor SOPs for environmental data collection. Prepares audit reports summarizing procedures used and makes recommendations for improvement, if necessary.

Contractor/Consultant/Laboratory – Quality Assurance Project Plan Coordinator
Responsibilities: Ensures that appropriate analytical methods, Laboratory SOPs, QA/QC procedures, documentation, and training are implemented and routinely followed by all supervisory and technical staff of the contractor. Utilizes data review checklists and QC charts for both precision and accuracy data in the data quality review process. Conducts reviews of data files following review and approval by Laboratory supervisory staff.

Director - Contractor
Responsibilities: Ensures overall validation and final approval of data generated by the contractor. Assists as appropriate in the performance auditing of all activities performed by contractor personnel.

A.5 PROBLEM DEFINITION/BACKGROUND

The Small Business Liability Relief and Brownfields Revitalization Act was signed into law on January 11, 2002. The Act amends several sections of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Title II of the Act amends sections 101, 104, 107 and added Section 128. These amendments provide an updated definition of "brownfield", establish several funding programs for assessment and cleanup of brownfield properties, clarify liability protection for innocent landowners, contiguous property owners, and prospective purchasers of brownfield properties, and establish State Response Programs. Section 128(a) of the Act authorizes a grant program awarded and administered by the United States Environmental Protection Agency (EPA) to establish and enhance state response programs that address the assessment, cleanup

and redevelopment of brownfields sites and other contaminated sites as defined by the law. Missouri Department of Natural Resources is one of the 19 states that have Memoranda of Agreements with EPA and are automatically eligible for state and tribal funding under Section 128(a). The amendments clarify that in order to qualify for liability protection under CERCLA, prospective purchasers must perform "all appropriate inquiry" into the history of a property. EPA will promulgate final regulations governing all appropriate inquiry, but until that time the amendment provides that assessments carried out in accordance with ASTM Standard E1527-00 satisfy all appropriate inquiry. EPA expects to promulgate final regulations in early 2006.

Missouri's state response program, the Brownfields/Voluntary Cleanup Program, is administered by the Department of Natural Resources Hazardous Waste Program's Brownfields/Voluntary Cleanup Section (B/VCP). The B/VCP provides voluntary parties with technical assistance and oversight for the investigation and cleanup of properties contaminated with hazardous substances. The goal of the B/VCP is to cleanup contaminated properties and bring them back into productive use.

Grant funding will be used to cover the costs of a variety of activities at or in direct support of brownfields sites as defined under CERCLA 101(39). One of the activities that grant funding will be used is to perform Brownfield Assessments (BA). Brownfields are real properties in which their expansion, redevelopment, or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. The purpose of a BA is to minimize the uncertainties surrounding the actual or perceived contamination associated with these sites. In order to achieve this goal, the BA should identify whether petroleum products or hazardous substances have been or threaten to be released on or off site, identify contaminated media and quantify contaminate concentrations. The BA may also identify human or environmental populations that may be at risk from said releases. The BA may encompass one or both of the following activities:

- A Phase I Environmental Site Assessment (Phase I ESA), including a background and historical investigation and a preliminary site inspection;
- A Phase II Environmental Site Assessment (Phase II ESA), including sampling activities to identify the types and concentrations of contaminants.

The B/VCP will utilize the services of the consultant/contractor to plan for, conduct and report on environmental assessments of sites selected by the B/VCP for BAs. The Missouri Department of Natural Resources operates under its Quality Management Plan (QMP) when collecting or overseeing the collection of environmental sampling data. This plan requires that any subgrantees, contractors, or, in some cases, the regulated community, who generate environmental data develop QAPPs or other appropriate quality management tools. The QMP covers all intramural and extramural monitoring and measurement activities that generate and process environmental data for use by the department, including BA activities.

This QAPP is generic in that it applies to several site-specific projects. It is ongoing in that the projects are conducted continuously. A site-specific work plan detailing site

activities will be submitted to the B/VCP Project Officer for approval prior to any work conducted. Any deviations from or supplemental activity to the generic QAPP will be documented in a Site-Specific Quality Assurance Project Plan Addendum (SSQA).

A.6 PROJECT/TASK DESCRIPTION

When a site or property has been selected by the B/VCP for a BA, the B/VCP will select a consultant/contractor based on proposals submitted. The B/VCP Project Manager will send a request letter to the selected contractor Director. The contractor will provide the environmental assessments singly or consecutively as Phase I and/or Phase II ESAs, as specified by B/VCP and pursuant to the stated specifications. The contractor will conduct environmental assessments which meet or exceed the standards set by the latest edition of ASTM International's "Standard Practice for Environmental Site Assessment: Phase I Environmental Site Assessment Process" and "Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process." When EPA promulgates final regulations governing all appropriate inquiry, assessments must comply with the final rule.

A.6.1 Work Plans

The contractor will submit the written work plan to B/VCP at least two (2), but no more than four (4), calendar weeks after the initial request by B/VCP. The B/VCP will evaluate and, if acceptable, approve the written work plan(s) submitted for the environmental assessment of the specified property site. If the work plan is acceptable, B/VCP will provide written authorization to the contractor to proceed with the approved written work plan within two (2) calendar weeks after the submittal to B/VCP. B/VCP will have the final approval of all individual components of the written work plans revised as specified herein and reserves the right to require modifications, deletions, and or additional elaboration to the written work plans and reports as B/VCP deems necessary.

A.6.1.1 Phase I Environmental Assessment Work Plan

If a Phase I ESA is requested by B/VCP, the contractor will conduct a Phase I ESA to evaluate the historical sources of information about the property to determine the likelihood that petroleum products or other hazardous substances have been released on or near the property. The contractor will conduct a visual inspection of the property, including building interiors, if applicable. To the extent possible through non-sampling means, in conducting Phase I ESAs, contractor will identify the information listed below.

- **A.6.1.1.a** property site location
- **A.6.1.1.b** property site features/current property site condition
- **A.6.1.1.c** history of ownership (title search)
- **A.6.1.1.d** history of operations (city business directories, etc)
- **A.6.1.1.e** activities on site (manufacturing processes, types, compositions, and volumes of waste streams)
- **A.6.1.1.f** SARA Title III data
- **A.6.1.1.g** toxic release inventory data

A.6.1.1.h state and federal permit history
A.6.1.1.i storage facilities, including underground storage tanks
A.6.1.1.j dumps or landfills
A.6.1.1.k spills or incidents reported
A.6.1.1.l cleanups
A.6.1.1.m enforcement actions
A.6.1.1.n proximity to human or environmental populations
A.6.1.1.o off-site contamination and off-site contamination potential
A.6.1.1.p limited visual lead-based paints and asbestos inspection
A.6.1.1.q proximity to public and/or private wells and other environmentally sensitive receptors

A.6.1.2 Phase II Environmental Assessment Work Plan

If a Phase II ESA is requested by B/VCP, the contractor will conduct a Phase II ESA to evaluate the property and to sample the potential sources of contamination identified in the Phase I ESA. The work plan should include a sampling and analysis plan, a field sampling plan, a health and safety plan, signature page and reference to this generic QAPP and a SSQA if applicable. The work plan will provide general site information, describe the number, type, and location of samples to be collected (included on a site sketch) as well as analytical parameters and methods requested for each sample.

The work plan prepared by the contractor will include a brief description of all potential environmental concerns, including contamination by hazardous substances, accompanied by a site sketch that illustrates: proposed sampling locations; contaminant sources; migration pathways (e.g., wind, groundwater, sediments, surface water); exposure routes (e.g., ingestion, inhalation, direct contact); and human and ecological receptors.

In conducting a Phase II ESA, the contractor may measure groundwater flow direction. The contractor will sample any of, but not limited to, the following materials, potential sources, and environmental media and receptor populations:

A.6.1.2.a hazardous substances stored on site (including above or below ground tanks or conduits)
A.6.1.2.b buried drums or other containers
A.6.1.2.c debris or building materials
A.6.1.2.d spilled materials or residues
A.6.1.2.e soils and sediments
A.6.1.2.f surface waters
A.6.1.2.g groundwater
A.6.1.2.h soil gas
A.6.1.2.i surfaces (wipe samples)

A.6.1.3 Modifications to the Work Plan

Modifications to the written work plan will be permitted under the following conditions:

A.6.1.3.a B/VCP requested changes

If B/VCP determines that modifications to the written work plan are necessary or desired, the state agency will document the requested changes to the contractor in writing with any new instructions for the environmental assessment. Such changes may include the need for incidental sampling at the site, changes to the required completion date, or any other change to the original information and instructions. Based on the written instructions provided by B/VCP, the contractor will revise the written work plan according to the requirements for the written work plan. The contractor must submit the requested changes to B/VCP within 2 weeks, or the timeframe outlined in the written instructions.

A.6.1.3.b Contractor requested changes

If, after implementation of services, the contractor determines that modifications to the written work plan are necessary, including a request for an extension to the required date of completion, the contractor will submit a written request to B/VCP for changes. The written request will include the reason for the modification and will detail the contractor's proposed changes to the written work plan. B/VCP will review the written request of the contractor and send written notice of approval or disapproval of the request to the contractor within 5 calendar days after receipt of the contractor's written request. Contractors may not implement changes in the work plan without prior, written approval from B/VCP.

A.6.1.3.c Field Deviations from the Work Plan

Changes in site conditions between the time of the site reconnaissance and the on-site sampling visit and the visual appearance of the substance at the time of sampling may determine the actual number of samples collected. Such deviations or changes to the work plan while in the field will be made and approved by the B/VCP Project Officer who approved the work plan. If the Project Officer or designee is unavailable at the time the decision needs to be made in the field, the contractor will notify the Project Officer via electronic mail or voice mail of the deviations made and the reasons for the deviations. The deviations or changes will be documented in the final report prepared by the contractor and submitted to the B/VCP.

A.6.1.4 Specific Requirements of Work Plan Execution

A.6.1.4.a Initiation of Assessment Work

If the contractor receives written notification to proceed from B/VCP, the contractor will perform an environmental assessment in accordance with the approved written work plan. The contractor must begin each environmental assessment no later than 10 calendar days after receipt of written notification to proceed from the B/VCP. However, in the event that both a Phase I and a Phase II ESAs are required on the site, one of the following will apply, as specified by B/VCP at the time of the initial notification to proceed:

The contractor will not proceed with the Phase II environmental assessment, until (1) completion and approval of the Phase I environmental assessment by B/VCP and (2) after receipt from B/VCP of a written notification to proceed with the Phase II environmental assessment; or

When B/VCP determines that its purposes would be best addressed through expedited environmental assessments, B/VCP will direct the contractor to proceed with both the Phase I and Phase II ESAs, without waiting for a notice to proceed for Phase II.

A.6.1.4.b Contractor and B/VCP Responsibilities

The contractor will provide all services for the completion of environmental assessments including, but not limited to, records and title searches, site reconnaissance, interviews, subsurface exploration, sample collection, and chemical testing, as appropriate for the site and approved by B/VCP, and will submit to B/VCP any statement of outstanding issues regarding the specific environmental assessment, as well as the written report of the results as required herein.

The contractor will ensure and provide for the protection of the personal safety and health of all its workers on site, including the selection, provision, testing, decontamination, and disposal of all Personal Protective Equipment (PPE) and any required medical monitoring. The contractor will comply with all applicable worker safety and health laws and regulations. At all times during performance of services, the contractor will exercise reasonable professional judgement regarding safety and will use professional judgement as a criterion for cessation of services for safety reasons.

The B/VCP Project Officer will coordinate public contacts. The contractor will coordinate field activity scheduling, utility clearance and site access.

A.6.1.4.c Sampling

Generally, the scope of each Phase II ESA sampling event will include multiple soil borings, and certain soil borings will be converted to temporary wells for the collection and analysis of groundwater, if present, and determination of the direction of groundwater flow.

The contractor should identify the need to perform limited excavation at sites to obtain samples of buried material or to document other subsurface conditions. The contractor will manage the procurement, selection, and oversight of contractual services for excavation work.

When sampling is conducted, contractor personnel will collect the samples according to applicable Standard Operating Procedures (SOP) for sampling, which will be specified in the site-specific work plan and/or SSQA.

Samples collected for projects under this QAPP will be submitted to the contractor's laboratory for analysis. The contractor will conduct sample analysis using standard EPA testing methods. The analytical parameters will vary by project. On-site field screening analyses may be conducted by the contractor when a variety of unknown materials or media are present on-site, or when field screening analyses could result in significant economies in laboratory analytical work.

A.6.1.5 Reporting

The contractor will prepare and submit a full-color, complete written report of the results of the Phase I and/or Phase II ESA to B/VCP. The contractor will complete each environmental assessment by the time specified by B/VCP in the initial request and approved in the written work plan. The environmental assessment will not be considered complete until the written report is submitted and received as required. The written report must, at a minimum, contain the following information and results of the environmental assessment:

- **A.6.1.5.a** Property site(s) assessed
- **A.6.1.5.b** Maps and photographs of property site(s)
- **A.6.1.5.c** Site History (current and past owners and operators)
- **A.6.1.5.d** Overview of investigation
- **A.6.1.5.e** Background information (including topography and hydrogeology)

A.6.1.5.f Hazardous substances and hazardous wastes present (descriptions, contaminants, quantities)

A.6.1.5.g Receptor populations, both human and environmental (descriptions, numbers, locations)

A.6.1.5.h Soil investigations

A.6.1.5.i Surface water investigations

A.6.1.5.j Groundwater investigations

A.6.1.5.k Air investigations

A.6.1.5.l Sampling methods, field logs, chain of custody, analytical data and QA/QC documentation for field and laboratory (if Phase II environmental assessment was performed)

A.6.1.5.m Map depicting sample locations (drawn to scale) and concentrations

A.6.1.5.n Sampling data summary table including appropriate target levels for comparison

A.6.1.5.o Other information as may be requested by B/VCP

A.6.1.5.p Identity and quantity of investigation derived wastes. Documentation regarding the disposal of any waste or hazardous substances generated during the assessment.

A.6.1.5.q Summary and Conclusions. May include recommendations for proper handling of the various materials or conditions discovered that represent an imminent threat or hazard.

A.7 DATA QUALITY OBJECTIVES AND CRITERIA

A.7.1 Detection Limits, Accuracy & Precision

The detection limits, as specified in 40 CFR 136 Appendix A and EPA SW-846 Methods, are sufficient for BAs. The accuracy and precision of each analytical method are determined by using spikes and spike duplicate analyses, as specified in the EPA SW-846 methods. Calculation of precision and accuracy should be specified in the site-specific work plan and/or SSQA.

A.7.2 Data Representativeness

The data will be reviewed by the B/VCP Project Officer to assess how accurately and precisely it represents parameter variations at a sampling point or an environmental condition. The work plan will explain what the sample is to represent. The most frequent request will be to demonstrate what quantity of a hazardous substance is present in groundwater, surface water, air, soil or sediment.

A.7.3 Data Comparability

The objective of comparability for this QAPP is to ensure that sampling data developed during the project investigation may be readily compared to each other

and to the appropriate target levels. All data will be reported as ^{o} Celsius (flash point), pH units, µg/l or mg/l for water and liquids, µg/kg or mg/kg for soil, sediment or other solids, and mg/m^3 for air. Comparability is further addressed by using appropriate field and laboratory methods that are consistent with current standards of practice as approved by EPA.

A.7.4 Data Completeness

One hundred percent of data completeness is desired for all sampling requests. If less than one hundred percent is received, the B/VCP Project Officer will decide if the valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions is sufficient for its intended purpose. If not, additional sampling will be required.

A.7.5 Acceptability of Split Sample Data and Field Replicates

Field replicate acceptance criteria are site-specific and dependent upon sample media and analytical parameters. This QAPP is generic, covering many different projects and a large number of analytes in various complex sample matrices. When released to the environment, many contaminants distribute themselves extremely unevenly in soils. This problem is further confounded by the heterogeneous nature of the dense clayey and silty clay soils found in many areas of the state. The need to collect duplicate non-aqueous samples for VOC analysis exacerbates the problem further still, since the primary and duplicate samples may not be homogenized prior to analysis. Great care will be taken when interpreting overall sampling and analysis data for non-aqueous duplicate and replicate split samples. The B/VCP Project Officer, in consultation with appropriate contractor personnel, will evaluate all qualified data on a project-specific basis, and determine how/whether to use the data.

A.8 SPECIAL TRAINING/CERTIFICATION

Sample collectors are required to successfully complete a 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) site safety course in accordance with 40 CFR Part 311, which references 29 CFR 1910.120. Staff are also expected to be trained on sampling for hazardous materials as well as read and be familiar with applicable SOPs, the generic QAPP, the site-specific work plan and the SSQA prior to performing actual sample collection.

Specific training requirements may be necessary for personnel operating field analytical or sampling equipment or specialized equipment, such as an X-ray Fluorescence (XRF) analyzer or geophysical instruments. Manufacturer's requirements and recommendations should be followed.

A.9 DOCUMENTS AND RECORDS

Documentation procedures should be conducted in accordance with EPA's record keeping requirements. Work plans and final reports will be generated and submitted to B/VCP for review and approval.

B: DATA GENERATION AND ACQUISITION

B.1 SAMPLING PROCESS DESIGN

The types of information inputs required to design the Phase II ESA work plan may be gathered from numerous sources including: Phase I ESA, site reconnaissance, interviews of site owners or operators, published reference books and resources, databases, and internet resources.

The goal of each BA is to identify areas of surface and subsurface contamination, not necessarily to fully delineate the extent of contamination or to locate all sources. BA projects primarily are limited screening investigations, the results of which will be used by the BA recipient to evaluate potential future use and/or development of the property. The projects usually involve a limited number of samples and budget limitations, both of which may preclude implementing a statistical sampling design. Based on these factors, the sampling designs for BAs will primarily use the judgmental sampling technique. When developing a plan for a judgmental sampling design, the following site information should be considered: potential contaminant(s) and locations based on past property uses, soil properties that affect contaminant migration, physical and chemical nature of potential contaminant(s), the manner in which contaminant(s) may have been released, and timing, duration and amount of potential release(s). The sampling process design will be described in detail in the site-specific work plan and/or SSQA.

A background sample will be collected for each type of environmental media sampled (e.g., soil, sediment, groundwater, surface water, air) for each project. All QC samples will be collected in accordance with EPA guidance and described in the site-specific work plan. All QC samples will be documented in the sampling report. See Section B.5 for more information on QC samples.

B.2 SAMPLING METHODS

The field investigations and sample collection activities under the project will adhere to applicable SOPs and available EPA guidance and will be described in the site-specific work plan and/or SSQA.

Manufacturer's specifications and operational instructions, other agency SOPs, other methods, instructions, including professional or scientific technical standards, may also be used for specific field analytical equipment, geophysical equipment, surveying instruments, etc., with no existing SOPs or EPA guidance upon approval of the B/VCP Project Officer. The site-specific work plan will specify sampling methodologies and procedures used.

B.3 SAMPLE HANDLING AND CUSTODY

Sample handling and custody will be accomplished according to SOPs and using standard forms developed by contractor's laboratories. Sample container selection will be according to appropriate method guidance and/or SOPs. The site-specific work plan will specify sample handling procedures, specifying sample containers, preservation, holding times, chain-of-custody and field documentation, handling of samples in the field, and

transport of samples to the laboratory. All analyses will be conducted within the EPA-specified maximum sample holding time limits. Any data obtained from analyses conducted on samples after the specified holding time limit will be qualified by the laboratory in sample result documentation and discussed in the sampling report.

B.4 ANALYTICAL METHODS

Field analytical measurements will be according to SOPs and manufacturer's operational instructions, such as immunoassay kit instructions, photoionization detector (PID) instructions, XRF manual, etc. Calibration and other QA/QC actions will be accomplished according to SOPs, manufacturer's minimum recommendations/ requirements and other appropriate scientific or technical standards. Appropriate EPA guidance, SOPs, best professional judgement and accepted industry and scientific practices will be used when correlating field analytical data to definitive data.

Laboratory measurements will be performed by the selected laboratory according to the method requested, generally according to EPA Solid Waste Methods (SW)-846 specified container, preparation and analytical methods. The QC procedures specified in these methods must be followed. The detection limits of the selected analytical methods generally will be able to achieve the concentrations of interest needed for BAs. Analytical parameters will vary by project; therefore, the analytical methods used for the parameters of concern should be specified in the site-specific work plan and/or SSQA. Any non-standard methods, along with associated validation procedures, should be specified in the site-specific work plan and/or SSQA, and will need prior approval by the B/VCP. An explanation as to why non-standard methods are being proposed should also be included in the site-specific work plan and/or SSQA.

All QC documentation must be provided with each analytical deliverable package. The contractor will be responsible for ensuring all analytical data provided by the contractor's laboratory for the project meets the contract requirements and the requirements of this QAPP. If the analytical data do not meet contract requirements, the issue will be handled as described in Section D.3 Reconciliation With User Requirements.

B.5 QUALITY CONTROL

QC samples will be required to verify the validity of analytical results and to assess whether the samples were contaminated from sources not directly attributable to releases at the site (such as improper decontamination, cross-contamination, laboratory contamination, etc.). Field QC samples may include trip blanks, field blanks, equipment blanks/rinsate samples, replicates/field duplicates as appropriate. The field QC samples proposed for collection will be included in the site-specific work plan. Trip blanks indicate if any activities after obtaining the trip blank may have contaminated samples during transport. Field blanks are samples obtained in the field to determine if contaminants were introduced by sample containers, preservatives, sampling procedures, etc. Replicate samples may be obtained to assess the reproducibility of the sampling procedures, data obtained and the analytical methods. Rinsate samples are obtained to verify adequate decontamination of sampling equipment. For all projects involving the collection of aqueous samples, a trip blank will be included at a frequency of one per

separate sampling event (mobilization). An equipment rinsate blank will be collected for projects where the sampling equipment is decontaminated in the field for reuse. The equipment rinsate blank will be collected at a frequency of one per separate sampling event (mobilization) for each different combination of sampling equipment, decontamination method, and analytical parameter.

Contaminants should not be detected above the laboratory reporting level in trip blanks, field blanks, and equipment rinse blanks. Any data that do not meet these accuracy criteria will be qualified on sample results. The B/VCP Project Officer and contractor personnel will evaluate all qualified data on a project-specific basis, and determine how/whether to use the data.

Total precision of the entire sampling and analytical process will be assessed using analyses of blind field duplicate and replicate split samples. Aqueous precision QC samples will be collected as duplicates, while non-aqueous precision QC samples will be sampled as replicate splits.

For BAs, one set of precision QC samples for each media (groundwater, surface water, soil/sediment, air) will be collected per site. Where both soil and sediment are sampled, contractor personnel will collect the replicate split of whichever media is sampled most at a given project. All QC samples will be documented in the sampling report

Laboratory QC samples include duplicates, spikes, laboratory blanks, and performance evaluation samples, and are performed by the fixed laboratory as according to the approved laboratory QA/QC plans.

B.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

Field analytical instruments used during this project will be maintained and calibrated according to instructions provided by the instrument manufacturer, and other appropriate scientific and technical guidance and standards pertinent to the specific instrument in use. The contractor will be responsible for performing operational checks on all field equipment prior to use in the field. An operational problem with any field instrumentation will be noted by the contractor in the field notebook. Daily or regular calibration of field instrumentation will be according to applicable SOPs and manufacturer's instructions and indicated or referenced in the site-specific work plan.

Fixed laboratory equipment for contract laboratories used for quantitative sample analysis will be tested, inspected, calibrated and maintained according to the specific analytical equipment requirements as stated in the SOPs of the laboratory, in accordance with manufacturer-specified procedures or method-specified procedures, as appropriate.

B.7 INSTRUMENT/EQUIPMENT CALLIBRATION AND FREQUENCY

Maintenance and calibration procedures will be conducted in accordance with manufacturers instrument manuals, method-specified procedures and the laboratory SOPs, as appropriate.

B.8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Inspection and acceptance of supplies and consumables will be conducted according to laboratory SOPs.

B.9 NON-DIRECT MEASUREMENTS

Non-direct measurement data is the basis for Phase I and II ESAs and is accepted by industry and EPA in accordance with ASTM Standards. Several types of data and information may be obtained from non-measurement sources for use in projects conducted under this QAPP. The primary types of non-measurement data are listed in Section B.1 Sampling Process Design, first paragraph. These data may be used to design sampling plans and may be used with the directly measured data collected during each project to evaluate the potential need for further site characterization, remediation and/or suitability for development. Non-direct measurement data will be documented and referenced in any document for which they are used.

B.10 DATA MANAGEMENT

Data management, including chain-of-custody review and correction, data review, reduction and transfer to data management systems, quality control charts, quality control procedures, and sample receipt, storage and disposal, will be in accordance with applicable SOPs and accepted industry practices.

Documentation will be in accordance with applicable SOPs and accepted industry practices, and will include the sampling reports, copy of the chain-of-custody, and field QA controls with the analytical results. All sample documents will be legibly written in ink. Any corrections or revisions to sample documentation shall be made by lining through the original entry and initialing and dating any changes. Data reduction will occur in accordance with contractor analytical SOPs for each parameter. If difficulties are encountered during sample collection or sample analyses, a brief description of the problem will be provided in the sampling report prepared by contractor. Data reporting will be in accordance with applicable SOPs and will include, at a minimum:

- Sample documentation (location, date and time of collection and analysis, etc.)
- Chain-of-custody forms
- Initial and continuing calibration
- Determination and documentation of detection limits
- Analyte(s) identification
- Analyte(s) quantitation
- Quality Control sample results
- Duplicate results

Adequate precautions will be taken during the reduction, manipulation, and storage of data in order to prevent the introduction of errors or the loss or misinterpretation of data.

C: ASSESSMENT AND OVERSIGHT

C.1 ASSESSMENTS AND RESPONSE ACTIONS

This section describes the internal and external checks necessary to ensure that all elements of the QAPP are correctly implemented as prescribed, that the quality of the data generated by implementation of the QAPP is adequate, and that any necessary corrective actions are implemented in a timely manner.

C.1.1 Laboratory Performance Assessment

Laboratories will comply with all of the EPA and the National Environmental Laboratory Accreditation Conference (NELAC) requirements for laboratory QA programs. Data resulting from the participation in this program shall be reviewed by the laboratory Quality Assurance Manager and any problems shall be addressed.

C.1.2 Field Performance Assessment

The auditor in charge of field QA will conduct audits of field activities according to contractor QA field auditing procedures. The process of choosing when field audits are conducted is not based on a particular project or site-sampling event, but rather on assuring that each person involved in sample collection is audited at least once per year. The contractor's field QA auditor will have the responsibility for initiating and implementing response actions associated with findings identified during the field audit. The field personnel shall properly address any response actions needed.

C.1.3 Overall QAPP Assessment

EPA Region VII conducts periodic evaluations of the state's environmental programs. These evaluations normally include some type of review of the program's quality management system, and may include examination of QAPPs.

C.1.4 Data Validation

All field and laboratory data will be subject to validation to review for accuracy, precision, completeness, representativeness and comparability, and is discussed in more detail in Section D. The acceptance criteria for measurement data are discussed in Section A.6.

C.1.5 Overall Project Performance Assessment

The B/VCP Project Officer will evaluate and report on the overall performance of the tasks described herein at the close of each fiscal year. The B/VCP Project Officer will provide the evaluation to the B/VCP Environmental Manager, who will communicate deficiencies and areas that need improvement to the contractor's Director.

Specifically, the following items will be evaluated for how well the performance of tasks met the specification of this QAPP and the goals of the BA program administered by the B/VCP: data quality, data completeness, report completeness,

usability and clarity of report narrative, figures and maps, and timeliness of report completion.

C.2 REPORTS TO MANAGEMENT

Data from the contractor's laboratory will be submitted to the B/VCP Project Officer as an appendix to the final report using the laboratory analytical report sheets. The report sheets will include documentation of the sampling location, sample description, date of collection, collector, analysis performed and results, date of analysis, and analytical method used. A copy of the chain-of-custody and the lab results should also be attached to the final report. In addition, an explanation of any deficiencies in data quality should be provided with the sampling report.

Field performance assessment audits will be documented by the contractor's field QA auditor in a written report that will be kept on file at the contractor's office. Results from the laboratory's audit studies will be kept on file at contractor's office.

Comments and recommendations from the EPA Region VII periodic evaluations of state environmental programs are provided to the DEQ QA manager and used by DEQ management and staff to take any corrective actions which may be needed.

D: DATA VALIDATION AND USABILITY

D.1 DATA REVIEW, VERIFICATION AND VALIDATION

To ensure that measurement data generated when performing BAs are of an appropriate quality, all data will be validated. Data validation is a systematic procedure for reviewing a body of data against a set of established criteria to provide a specified level of assurance of its validity prior to its intended use. The techniques used must be applied to the body of the data in a systematic and uniform manner. The process of data validation must be close to the origin of the data, independent of the data production, and objective in its approach. All data, as applicable, from BAs will be validated in accordance with EPA guidance, per Data Quality Objectives Process. Any deviations will be documented and provided with the analytical data report.

D.2 VERIFICATION AND VALIDATION METHODS

D.2.1 Documentation, Data Reduction and Reporting

Documentation will include the sampling reports, copy of the chain-of-custody, and field QA controls with the analytical results. Data reduction will occur in accordance with the laboratory's analytical SOPs for each parameter, consistent with EPA or other established methods. If an unusual calculation is applied to the data and is not documented in the established method or laboratory SOP, the full dimensional formula must be defined in the SSQA. If difficulties are encountered during sample analyses, a brief description of the problem will be provided.

Data derived from sampling events undertaken for this project will be reported to the B/VCP Project Officer as discussed in Section C.2. Reports to Management.

D.2.2 Data Validation

Data validation will occur as described in the analytical SOPs for each parameter and the laboratory SOPs for data review. Data validation is accomplished using control charts and data review checklists. Discrepancies are noted in the analytical file and appropriate data flags are used. If data is determined to be outside of control limits, the data is flagged on the report of analysis.

The laboratory personnel will look at matrix spikes/matrix spike duplicates, lab blanks, and lab duplicates to ensure they are acceptable. The sample collector will compare the sample descriptions with the field sheets for consistency and ensure that any anomalies in the data are documented. The contractor will perform a final review and approval to ensure that the data meets the quality objectives of this QAPP and, if applicable, the SSQA. The contractor's review and approval is a check on the reviews conducted by the laboratory to ensure consistency of all field and analytical data that is generated by the contractor.

D.3 RECONCILIATION WITH USER REQUIREMENTS

Once the final report is submitted, the B/VCP Project Officer will review the field duplicates to determine if they appear to indicate a problem with meeting quality objectives. If problems are indicated, the B/VCP Project Officer will contact the contractor to discuss and attempt to reconcile the issue. Completeness will also be evaluated to determine if the completeness goal for this project has been met. If data quality indicators do not meet the project's requirements as outlined in this QAPP and applicable SSQA, the data may be discarded and re-sampling may occur. The B/VCP Project Officer will determine the cause of the failure (if possible) and make the decision to discard the data and re-sample. If the failure is tied to the analyses, calibration and maintenance techniques will be reassessed as identified by the appropriate lab personnel. If the failure is associated with the sample collection and re-sampling is needed, the sampling methods and procedures will be reassessed as identified by the field audit process.

Corrective action will be undertaken by all parties to address specific problems as they arise. Corrective actions required will be identified through the use of control charts for chemical analyses, precision and accuracy data, through performance auditing, and through systems audits.

REFERENCES

- EPA Guidance for Representative Sampling, OSWER Directives 9360.4-10 and 9360.4-16, December 1995.
- EPA Guidance for Quality Assurance Project Plans, EPA/600/R-98/018, February 1998.
- EPA Guidance for Data Quality Assessment, EPA/600/R-96/084, January 1998.
- EPA Guidance for Data Quality Objectives Process, EPA/600/R-96/055, September 1994.

APPENDIX A: LISTING OF ACRONYMS & TERMS

BA	Brownfield Assessment
B/VCP	Brownfields/Voluntary Cleanup Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DEQ	Division of Environmental Quality
DQO	Data Quality Objectives
EPA	United States Environmental Protection Agency
HAZWOPER	Hazardous Waste Operations and Emergency Response
MCL	Maximum Contaminant Level
MRBCA	Missouri Risk-based Corrective Action Process
NELAC	National Environmental Laboratory Accreditation Conference
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RFP	Request for Proposal
SOP	Standard Operating Procedure
SSQA	Site-Specific Quality Assurance Project Plan Addendum
SVOC	Semi-Volatile Organic Compound
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

Duplicate or co-located sample is a sample obtained from the same location, at the same time, and of the same material as the original sample. Duplicate water samples are used primarily to assess precision associated with sampling methodology, and to a lesser extent sample heterogeneity and analytical procedures. Duplicate soil samples are used primarily to determine the variability or heterogeneity of the sampled media. Due to the heterogeneity of soils, caution must be used if attempting to assess precision associated with sampling methodology or analytical procedures.

Hazardous Substance means a substance defined as hazardous pursuant to federal rule 40 CFR 302.4, which includes asbestos and Polychlorinated Biphenyls (PCBs); any substance designated pursuant to Section 311(b)(2)(A) of the federal Water Pollution Control Act; any toxic pollutant listed under Section 307(a) of the federal Water Pollution Control Act; any hazardous air pollutant listed under Section 112 of the Clean Air Act; any imminently hazardous chemical substance or mixture with respect to which the Administration of EPA has taken action pursuant to Section 7 of the Toxic Substances Control Act; any hazardous waste; any hazardous material designated by the Secretary of the U.S. Department of Transportation under the Hazardous Materials Transportation Act; any radioactive materials; or any petroleum product.

Hazardous waste means waste defined to be hazardous pursuant to the Missouri Hazardous Waste Management Law Section 260.350 to Section 260.430 or pursuant to federal rule 40 CFR 261.

Replicate split sample is obtained by dividing or splitting one sample that has been mixed or homogenized into two samples for separate analysis. A replicate split is collected primarily to assess precision associated with analytical procedures and to a lesser extent sample handling procedures. Replicate split samples of soils or other non-aqueous materials are not recommended if volatile organics analyses are requested due to the potential loss of the volatiles during the mixing process. Duplicate samples for volatile organics analyses are sometimes collected prior to mixing, however, there may be a greater potential for inconsistency due to the heterogeneous nature of soils or other non-aqueous media.

APPENDIX B: ANALYTICAL REQUIREMENTS

The detection limits, as specified in 40 CFR 136 Appendix A and the EPA SW-846 Methods, are sufficient for BAs. The accuracy and precision of each analytical method are determined by using spikes and spike duplicate analyses, as specified in the EPA SW-846 methods.